

Final Report

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ROSAT Guest Investigator Program (AO-2)

On A Search for Coronal X-ray Emissions
from Magnetic DA White Dwarfs

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OBSERVATIONS AND DATA ANALYSIS

In the proposal awarded by NASA/GSFC, we have suggested that cool and purely hydrogen magnetic white dwarfs may be sources of X-ray coronal emission and proposed three prominent candidates for this emission (GD 90, KUV 2316-123 and GD 356) to be observed during the second (AO-2) phase of ROSAT pointed observations. The stars KUV 2316-123 (*B-category observation* with 10,000 s of the exposure time), GD 356 (*B-category observation* with 5,000 s exposure time) and GD 90 (*A-category observation* with 10,000 s of the exposure time) were observed on Dec. 3, 1991, Jan. 4 and April 3, 1992, respectively. We have received the tapes with the data and have made preliminary analysis by using the NASA/MSFC computer facilities. The analysis has been done during summer 1992 and the P.I. used the grant to pay one month of his salary while performing the data

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analysis. It seems that there is no x-ray source associated with the nominal location of KUV 2316-123 and GD 90. In the case of GD 356, however, the problem was that a X-ray source was found very close to the star and it was not clear to us whether this source could be identified with GD 356. To solve this problem the P.I. visited the Center for Astrophysics in the middle of November and spent several days at the ROSAT Science Center analyzing the data. The analysis has shown that **only GD 356 is a potentially verifiable source of coronal X-rays, with a so-far-inconclusive 2σ detection** (Musielak, Davis and Porter, 1993 to be submitted to *Astrophys. J. Letters*). It has been also confirmed that two other observed cool magnetic white dwarfs do not appear to have significant X-ray emission. The comparison between the analyzed ROSAT data for GD 356 and the Einstein image for the same field of view showed no X-ray source; this is consistent with lower sensitivity of instruments on the *Einstein Observatory*. Because GD 356 is a cool ($T_{eff} = 8000$ K) and magnetic ($B = 1.5 \times 10^7$ G) white dwarf, any X-ray emission observed from this star must be of coronal origin. In addition, GD 356 is the only known white dwarf for which evidence of chromospheric activity has been reported by Greenstein and McCarthy (1985, *Astrophys. J.* **289**, 732). Unfortunately, GD 356 was observed by ROSAT for only 5,000 s, half the exposure time of two other selected white dwarfs. We believe that **GD 356 may be the first white dwarf to be seen in coronal X-ray emission**, therefore, we are asking for 50,000 s of observing time with the ROSAT PSPC during the phase AO4 of the ROSAT observation.

Further, we have recently been granted 100 ksec to observe this star with EUVE. If GD 356 is selected for ROSAT AO4, we would be in a position to make an attractive comparison of long exposure observations with ROSAT and EUVE.

It is our intention to report the results of our analysis to the scientific community at large by publishing several papers in the *Astrophysical Journal Letters*.